Claims

What is claimed is:

1. An apparatus for measuring at least one parameter of a mixture flowing through a pipe, said apparatus comprising:

a pair of ultrasonic transducers disposed axially along the pipe for measuring the transit time of an ultrasonic signal to propagate from one ultrasonic transducer to the other ultrasonic transducer; and

a processor, responsive to said transit time signal, which provides an output signal indicative of the at least one parameter of the mixture flowing through the pipe.

2. The apparatus of claim 1, wherein the processor determines the speed of sound of the mixture in response to the transit time signal.

3. The apparatus of claim 1, wherein the pair of ultrasonic transducers comprises:

an ultrasonic transmitter disposed at an axial location along the axial bore

an ultrasonic receiver disposed at an axial location along the pipe, the ultrasonic receiver being axially spaced from the ultrasonic transmitter, wherein the ultrasonic transmitter transmits an ultrasonic signal to the receiver through the mixture, the ultrasonic receiver providing a transit signal indicative of the transit time of the ultrasonic signal.

4. The apparatus of claim 1, wherein the apparatus is a probe.

5. The apparatus of claim 1, wherein the frequency of the ultrasonic signal is sufficiently low to minimize scatter from particle/liquid within the mixture.

6. The apparatus of claim 1 wherein the signal processor comprises logic, which calculates a vapor/liquid composition of the fluid flow and/or mixture passing through the pipe.

7. The apparatus of claim 1 wherein the frequency based sound speed is determined utilizing a dispersion model to determine the at least one parameter of the fluid flow and/or mixture.

8. The apparatus of claim 1, wherein the pair of ultrasonic transducers includes a plurality of transducers disposed axially along the pipe to determine the transit time using the sing around method.